

Key

POWERS OF TEN

Positive

$$\begin{aligned} 10^1 &= 10 \\ 10^2 &= 100 \\ 10^3 &= 1,000 \\ 10^4 &= 10,000 \\ 10^5 &= 100,000 \end{aligned}$$

Negative

$$\begin{aligned} 10^{-1} &= 1/10 = 0.1 \\ 10^{-2} &= 1/100 = 0.01 \\ 10^{-3} &= 1/1,000 = 0.001 \\ 10^{-4} &= 1/10,000 = 0.0001 \\ 10^{-5} &= 1/100,000 = 0.00001 \end{aligned}$$

Multiplication: For powers of 10 that are **greater than 1**, the exponent in the power tells you the number of places to **move the decimal point to the right**. For powers of 10 that are **less than 1**, the **decimal moves to the left**.

Examples:

$$\begin{aligned} 23.9 \times 10 &= 239 & 23.9 \times 0.1 \text{ (or } 1/10) &= 2.39 \\ 23.9 \times 100 &= 2,390 & 23.9 \times 0.01 \text{ (or } 1/100) &= 0.239 \\ 23.9 \times 1000 &= 23,900 & 23.9 \times 0.001 \text{ (or } 1/1000) &= 0.0239 \end{aligned}$$

Division: For powers of 10 that are **greater than 1**, the exponent in the power tells you the number of places to **move the decimal point to the left**. For powers of 10 that are **less than 1**, the **decimal moves to the right**.

Examples:

$$\begin{aligned} 23.9 \div 10 &= 2.39 & 23.9 \div 0.1 \text{ (or } 1/10) &= 239 \\ 23.9 \div 100 &= 0.239 & 23.9 \div 0.01 \text{ (or } 1/100) &= 2,390 \\ 23.9 \div 1000 &= 0.0239 & 23.9 \div 0.001 \text{ (or } 1/1000) &= 23,900 \end{aligned}$$

Practice Problems:

1. $9.3 \times 10 = 93$

2. $74.52 \times 0.1 = 7.452$
 (arrow pointing down from 74.52 to 7.452, labeled "of 1/10")

3. $22 \times 0.001 = 0.022$
 (arrow pointing down from 22 to 0.022, labeled "1/1000")

4. $0.8 \times 10^3 = 800$

5. $633 \div 100 = 6.33$

6. $8.21 \div 0.1 = 82.1$

7. $5.2 \div 0.001 = 5,200$
 (arrow pointing up from 5.2 to 5,200, labeled "1/1000")

8. $47 \div 0.001 = 47,000$
 (arrow pointing up from 47 to 47,000, labeled "1/1000")

"How many $\frac{1}{1000}$ are in 5.2?"

"How many $\frac{1}{1000}$ are in 47?"